

1. A method of imaging comprising:

receiving magnetic field gradient directions specified for an MRI scan of a microscopic structure;

generating images for each magnetic field gradient direction;

5 collecting pixel information from the generated images for a given pixel of interest;

assembling the pixel data onto a surface of at least one sphere; and

determining properties of a diffusion function on the at least one sphere by transforming the pixel data assembled onto the surface of the at least one sphere using a spherical transform.

10 2. The method of claim 1 further comprising:

repeating the steps of collecting, assembling and calculating for each additional pixel of interest.

3. The method of claim 2 further comprising:

15 displaying results of the diffusion function properties determination.

4. The method of claim 1 wherein the properties of the diffusion function on the at least one sphere comprise an orientation distribution function (ODF).

20 5. The method of claim 4 wherein determining comprises:

if the at least one sphere comprises multiple spheres, adding corresponding pixel data assembled on surfaces of the multiple spheres to produce pixel data for one sphere;

selecting a direction through such sphere;

identifying the major circle for the selected direction;  
computing pixel values on the major circle by interpolating the pixel data on the sphere;  
calculating an ODF value for the selected direction by adding the pixel values on the  
major circle;

5           determining if other directions are to be selected; and  
if other directions are to be selected, repeating the steps of selecting, identifying,  
computing and calculating for each of the other directions.

6.       The method of claim 5 wherein interpolating the pixel data on the sphere comprises using  
10   a Parzen window interpolation.

7.       The method of claim 5 wherein determining comprises:  
rendering the ODF values as a spherical polar plot.

15   8.       The method of claim 1 wherein the spherical transform comprises a Funk-Radon  
transform.

9.       The method of claim 1 wherein the radius of the at least one sphere is chosen according to  
a length scale of interest.

20   10.      The method of claim 1 wherein the microscopic structure comprises a microscopic tissue  
structure.

11.      An article comprising:

a storage medium having stored thereon instructions that when executed by a machine result in the following:

obtaining images of a microscopic structure for different magnetic field gradient directions;

5       collecting pixel information from the images for a given pixel of interest;

assembling the pixel data onto a surface of at least one sphere; and

determining properties of a diffusion function on the at least one sphere by transforming the pixel data assembled onto the surface of the at least one sphere using a spherical transform.

10    12.    The article of claim 11 wherein the instructions further comprise instructions that when executed by a machine result in the following:

repeating the steps of collecting, assembling and calculating for each additional pixel of interest.

15    13.    The article of claim 12 wherein the instructions further comprise instructions that when executed by a machine result in the following:

displaying results of the diffusion function properties determination.

14.    The article of claim 11 wherein properties of the diffusion function on the at least one  
20    sphere comprise an orientation distribution function (ODF).

15.    The article of claim 14 wherein determining comprises:

if the at least one sphere comprises multiple spheres, adding corresponding pixel data  
assembled on surfaces of the multiple spheres to produce pixel data for one sphere;

selecting a direction through such sphere;

identifying the major circle for the selected direction;

5        computing pixel values on the major circle by interpolating the pixel data on the sphere;

calculating an ODF value for the selected direction by adding the pixel values on the  
major circle;

determining if other directions are to be selected; and

if other directions are to be selected, repeating the steps of selecting, identifying,

10        computing and calculating for each of the other directions.

16.     The article of claim 15 wherein determining further comprises:

rendering the ODF values as a spherical polar plot.

15        17.     The article of claim 11 wherein the spherical transform comprises a Funk-Radon  
transform.

18.     The article of claim 11 wherein the radius of the at least one sphere is chosen according to  
a length scale of interest.

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19.     The article of claim 11 wherein the microscopic structure comprises a microscopic tissue  
structure.

20.     A system comprising:

an interface adapted to receive magnetic field gradient directions specified by a user for an MRI of a microscopic structure;

a controller, coupled to the user interface and an MRI scanner, operative to control the MRI scanner to generate images of the microscopic structure for each magnetic field gradient

5 direction; and

a processor, coupled to the controller, configured to collect pixel information from the generated images for a given pixel of interest, assemble the pixel data onto a surface of at least one sphere and determine properties of a diffusion function on the at least one sphere by transforming the pixel data assembled onto the surface of the at least one sphere using a spherical  
10 transform.

21. The system of claim 20 wherein the properties of the diffusion function on the at least one sphere comprise an orientation distribution function (ODF).

15 22. The system of claim 20 wherein the spherical transform comprises a Funk-Radon transform.

23. The system of claim 20 wherein the radius of the at least one sphere is chosen according to a length scale of interest.

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